

VIGILANTE FORENSIC

Human Factors | Ergonomics Consulting

Report of: William J. Vigilante, Jr., PhD, CPE

Date: January 29, 2016

Case Caption: Parvez & Razia Yazdani
Vs.
BMW of North America

VF Case Number: 15-004

Prepared for: Patrick A. Hughes
de Luca Levine, LLC
Three Valley Square, Suite 220
512 E. Township Line Road
Blue Bell, PA 19422

200 Pembroke Circle
Phoenixville, PA 19460

Tel: 267.439.1551
bill@vigilanteforensic.com

www.vigilanteforensic.com

A. INTRODUCTION

At approximately 3:56 PM, on February 25, 2013, a fire was reported at the single family home of Parvez & Razia Yazdani, 1200 Windsor Road, Mechanicsburg, Cumberland County, PA. The fire originated at a 2004 BMW R1150 R motorcycle. Parvez started the motorcycle in his attached garage to let it warm up. While Parvez was in his home, a fire originated at the motorcycle which spread to the structure of the home. BMW of North America (BMW NA) imported and distributed the motorcycle. BMW NA has claimed that Parvez improperly left the engine running while the motorcycle was stationary.

The purpose of my investigation was to determine if the warnings provided in the BMW Rider's Manual were adequate and if BMW NA's failure to provide an adequate warning caused the fire.

I have included an updated CV outlining my qualifications and a listing of my testimonies for the past four years within the Appendix section of this report. Vigilante Forensic currently invoices my work associated with this investigation at a rate of \$335.00 per hour.

I may use the following materials as exhibits to illustrate my testimony: photos of the incident motorcycle and exemplar motorcycles; Rider's Manuals for the BMW R1100 R and R1150 RSL motorcycles; Owner's Manuals for the Yamaha and Harley Davidson motorcycles referenced in section E.2 of this report; recall warning label for the BMW R1100 RSL motorcycle; examples of on-product warnings on other motorcycles; example on-product warning for the BMW R1150 R motorcycle as described in Section E.3 of this report; and the references and standards cited within this report.

B. AVAILABLE MATERIAL

- Complaint
- Hampden Township Fire Company reports
- BMW NA's:
 - Answer with Affirmative Defenses
 - Responses to Plaintiff's First Set of Interrogatories
 - Responses to Plaintiff's First Request for Production of Documents
 - R1150 R Rider's Manual, dated October 2002
 - 1997 recall campaign documents for 1994 to 1996 BMW R1100RSL motorcycles
 - Discovery documents: Bates No. BMW NA000108, NA000109; NA000118 to NA000216; NA001032 to NA001092; NA001097 to NA001116; NA001301 to NA001219; NA001811 to NA001827; NA002032; NA002076 to NA002085; NA002104 to NA002118; NA002357 to NA002363
- Deposition transcripts and exhibits for:
 - Mark Yeldham, dated 12/17/2015
 - Parvez Yazdani, dated 9/22/2015

- Service records, Bates No. Yazdani000896 to Yazdani000969
- Report of Bradley A. Schriver, dated 12/20/2015
- Report of Michael Zazula, dated 1/29/2016

C. PRODUCT DESCRIPTION

The fire involved a BMW model R1150 R motorcycle (VIN WB10439A64ZF49253). The motorcycle was manufactured by Bayerische Motoren Werke (BMW) AG in Germany in 2004. BMW Group is a subsidiary of BMW AG (MY, 49). BMW of North America (BMW NA) is a part of BMW Group (MY, 49). BMW NA is the wholesale distributor of BMW motorcycles in the United States (MY, 56). BMW NA only sells motorcycles to authorized BMW dealerships (MY, 56,57).

The BMW R1150 R motorcycle was manufactured for model years 2000 to 2006 and was discontinued in 2007 (MY, 62,63). The BMW R1150 R motorcycle has an air/oil cooled twin cylinder engine (MY 58,59). 1150 designates the approximate size of the engine in cubic centimeters (MY, 60). BMW also offered an 850cc engine version of the motorcycle (e.g., R850R). An 89 page Rider's Manual is provided with the sale of a new motorcycle. The motorcycle possess five on-product warning labels (MY, 157).

The BMW R1150 R motorcycle is fuel injected with a manual choke (MY, 70-72). The choke is used to increase the engine speed (i.e., RPM) to assist in warming up the engine faster and more efficiently (MY, 72). The choke is controlled by a switch located on the left handlebar (MY, 70-72). The switch has three positions: off, detent, and press and release (full) (MY, 70,72). The full choke position increases the engine speed (RPM) more than the detent position (MY, 72).

The BMW R1150 R engine has an oil sight glass located on the left, front side of the crank case (MY, 96,97,102,103). The oil sight glass possesses a seal and a clear plastic cover with markings that allows the rider to check the level of oil in lieu of a dip stick (MY, 96,97). The plastic cover of the oil sight glass fails (i.e., melts, deforms) at a temperature of 329°F (MY, 107,109). The oil sight glass seal can also fail at elevated engine temperatures (MY, 106).

D. BACKGROUND AND INCIDENT DESCRIPTION

Parvez Yazdani and his family live in a single family home located at 1200 Windsor Road, Mechanicsburg, PA. Yazdani purchased the house in 2000/2001 (PY, 87). The home has an attached two car garage (PY, 16,18).

In April 2011, Parvez purchased a used BMW R1150 R motorcycle from a private owner (PY, 10,48). Parvez was given a manual when he purchased the motorcycle (PY, 6). Parvez read the manual after purchasing the motorcycle (PY, 7,10,22). Parvez parked the motorcycle in his garage (PY, 16,18).

Parvez had previously owned a Yamaha motorcycle that he purchased used in 1981 or 1982 (PY, 37,38). Parvez owned the Yamaha motorcycle for about 20 years (PY, 40). Parvez rode the Yamaha for recreation and always liked motorcycles (PY, 39,40). Parvez had also ridden other motorcycles and scooters in the past (PY, 35-37,53). Parvez did not take any motorcycle classes or subscribed to any motorcycle magazines (PY, 56,58).

Parvez testified that he decided to purchase the BMW R1150 R after researching motorcycles on the internet and based upon his ownership of BMW passenger vehicles (PY, 42,43,48). Parvez's purchase decision was also based on cost, bike weight, and whether the motorcycle was shaft or chain driven (PY, 9,42,43,45,46). Parvez did not care nor was he aware if the motorcycle was air-cooled or liquid-cooled (PY, 9,49,50,60).

Parvez was aware that the motorcycle had a two stage choke that he read about in the manual that he was given with the motorcycle (PY, 51,52). When Parvez started the motorcycle cold, he would hold the choke switch in the full position (PY, 51,52). Once the engine warmed up enough he would release the choke lever into the detent position (PY, 51,52). When he was satisfied that the engine was running fine he would turn the choke off (PY, 51,52).

Parvez did not winterize the motorcycle and would periodically start it one or two times a week to let the engine warm up and to keep everything running during the colder months (PY, 14-16,64). Typically, Parvez let the engine run seven to nine minutes with the motorcycle stationary while he smoked a cigarette (PY, 64).

At about 3:25 PM on February 25, 2013, Parvez started the motorcycle in his garage to warm up the engine (PY, 9,10). Parvez left the engine run while the motorcycle was stationary (PY, 9,14). While the engine was idling, Parvez got distracted, and went into the house (PY, 64,65). About 30 minutes after starting the motorcycle, the smoke alarms in his home went off and Parvez ran out to the garage where he found the bike on fire (PY, 64,65,68,69,77, 99,100). Parvez testified that the fire was coming from the motorcycle's engine and that the engine was no longer running (PY, 70,71). Yazdani also testify that there was oil on the garage floor from the motorcycle (PY, 70). A neighbor called 911 (PY, 72).

Bradley Shriver, plaintiff's fire origin and cause expert, investigated the fire. Within his December 20, 2015 report, Mr. Shriver concluded that the BMW R1150 R motorcycle was the ignition source of the fire. In his January 29, 2016 report, Michael Zazula, plaintiff's certified fire and explosion investigator, concluded that the fire was caused by an overheating condition from the motorcycle being left running in a stationary position, which caused the failure of the oil sight glass or sealing material allowing hot engine oil to escape and contact the exhaust header pipe and ignite.

Mark Yeldham is the Special Product Investigation Manager for BMW NA and testified as BMW NA's corporate designee in this matter (MY, 4,10,11). Mark Yeldham also investigated the fire.

Mark Yeldham concluded that the fire was a result of a failure of the oil sight glass consistent with the conclusions of Shriver and Zazula (MY, 129,130).

E. ANALYSIS

E.1. BMW NA Failed to Provide Adequate Warning.

BMW NA was aware of the potential fire hazard created by warming up the engine with the motorcycle at a standstill (MY, 177). For example, the copyrighted 2002, BMW R1150 R Rider's Manual notes:

WARNING:

Do not warm up the engine with the motorcycle at a standstill – risk of overheating or fire!
Ride way immediately after starting the engine.

Mark Yeldham testified that if a BMW R1150 R motorcycle is left idling in a stationary position, the oil sight glass cover can fail and cause a fire (MY, 155,177). Because the engine is air-cooled, heat can build up in the engine when the motorcycle is stationary. As the engine temperature increase, the oil temperature can increase to a level that will cause the oil sight glass cover and/or its seal to fail (MY, 113). If the oil sight glass cover/seal fails, extremely hot oil will be released from the engine (MY, 111,112). The oil will drip down, splash out, and vaporize (MY, 111-123). The released oil vapor can ignite when it comes into contact with the motorcycle's exhaust header and start a fire (MY, 111-113,123,127,128).

Although they were aware of the potential fire hazard created by warming up the engine with the motorcycle at a standstill, BMW did not provide any device on their R1150 R motorcycle to prevent the engine or exhaust from overheating (MY, 201,202). For example, in his January 29, 2016 report, Michael Zazula noted that BMW NA sold an optional fan kit to reduce engine temperature while the motorcycle was running/idling while standing still. Zazula also concluded:

In addition, the "optional police fan kit" should have been installed on the subject motorcycle as a standard equipment when manufactured/sold. It is clearly evident based upon the history of overheating of this motorcycles and usage within traffic or extended idling periods, this is a foreseeable event. Installing this BMW fan kit would have most likely prevented this incident.

Rather than implementing any design changes or adding any safeguards to prevent a fire, BMW NA chose to rely solely on the user recognizing the importance of riding away immediately after the motorcycle has been started. To alert and inform riders of the fire hazard and the need to immediately ride away after starting the motorcycle, BMW NA relied on their dealers to instruct the purchaser of a new motorcycle on the proper starting method and the use of warnings presented in the motorcycle's manual.

BMW NA requires their authorized dealers to train their sales people (MY, 76). The training includes how to deliver a new motorcycle to a customer (MY, 74). The delivery process includes instructing the rider on how to properly start the motorcycle (MY, 74). However, relying upon instructions given to the original owner of the motorcycle is not an adequate method to ensure that critical safety information reaches all users of the motorcycle including subsequent owners.

BMW NA was aware that their motorcycles are often re-sold by the initial owner (MY, 91). For example, the incident motorcycle was purchased and re-sold on prior occasions before Yazdani bought it. BMW NA was also aware that subsequent owners of the motorcycle were not likely to be provided with adequate instruction on the operation of the motorcycle (MY, 91). For example, Mark Yeldham testified (MY, 91):

Yes. That's the vehicle -- the Owner's Manual becomes the publication that the used -- the purchaser of the used motorcycle relies on to learn how to operate it, unless he asks and the seller spends time showing him how to operate it. But there again, that person is not trained by anybody to teach how to operate it.

If the subsequent owner is not provided with proper instruction and warning from a BMW NA trained representative when they purchase the motorcycle they will have to learn about the fire hazard created by warming up the engine with the motorcycle at a standstill from another source. BMW could not reasonably rely on dealer-provided training to alert, inform, and remind all potential users of the motorcycle of the fire hazard created by attempting to warm up the engine with the motorcycle at a standstill.

BMW motorcycles are sold with a Rider's Manual (i.e., product manual) when purchased new. The BMW R1150 R Rider's Manual instructs the reader on how to start the motorcycle and warns of the risk of fire if the engine is allowed to warm up at a standstill. With respect to the purchase of used motorcycles, BMW NA relies solely upon their Rider's Manual to communicate the features of the bike to secondary owners (MY, 91).

However, it is not reasonable for BMW NA to rely solely on a Rider's Manual to communicate critical safety related information and warnings to secondary owners of their R1150 R motorcycle (1-6). Critical warning and safety instructions must be provided where and when the information is needed and where the information is most likely to be encountered and seen (e.g., conspicuously and permanently placed on the motorcycle) (1-6). Often product manuals will not be read, read in their entirety, or may not be available at a later date or at all (2,3,5,7-11). For example, warnings research has shown that product users:

- Do not have the manual available for second hand products (9);
- Are less likely to read manuals for products they do not perceive as complex (7,11);

- Are less likely to read manuals when they believe they know how to use the product; that the manual will not be helpful or provide useful information; or it is quicker to learn about the product by using it (8);
- Often do not read the entire manual and only refer to sections of the manual that are of interest (7); and
- Believe hazardous products should have warnings located in close proximity to the product (10).

Consistent with the research cited above, BMW NA was aware that purchasers of used motorcycles may not always receive the Rider's Manual. For example, when discussing motorcycles sold between private parties, Mark Yeldham testified "One can only hope that they sold the bike and the Owner's Manual is still there." (MY, 91). "Hoping" is not a reasonable way to ensure that critical safety related information and warnings are communicated to second hand users of a product.

Furthermore, warnings presented in a Rider's Manual are likely to be overlooked, not encoded in memory, and/or forgotten during future operation of the motorcycle. For example,

- A warning presented in a multi-page manual can go unnoticed or overlooked when presented with additional, unrelated, and/or more interesting information (1-3,5,7,8,12);
- If the warning is read, the reader may not encode the information into their long term memory due to overload from all of the other information presented in the manual (2,3);
- Safety information that is read and encoded into long term memory is subject to decay and forgetting over time particularly if it is not relevant to the typical use of the product (2,3,12).

The Rider's Manual provided with the BMW R1150 R motorcycle is 89 pages long and presents information on a wide variety of topics including the motorcycle's features, operation, and maintenance. Within the 89 page Rider's Manual, there are only two references to the potential fire hazard associated with allowing the motorcycle engine to warm up at a standstill and the need to immediately ride away upon starting (pages 51 and 60). Given the amount of other, unrelated information and topics, it was foreseeable to BMW NA that riders would (a) overlook the warnings, (b) not encode the warnings, and/or (c) subsequently forget the warnings.

The BMW Rider's Manual's failure to provide adequate warning is evident in the testimony of Parvez Yazdani. Parvez testified that he received and read the manual that he was given when he purchased the incident BMW motorcycle. However, Parvez also testified:

- He read the manual basically to learn about things like type of engine, brake oil, level of oils, how to adjust control levers, how to adjust the suspension, and how to make sure proper maintenance was done (PY, 8,10).
- He read the manual but he does not recall if he read the warnings regarding leaving the engine idle at a standstill (PY, 22-24).
- If he read the warnings in the manual, he does not recall reading them (PY, 22).
- He did not recall any warnings from the manual at the time he started the motorcycle (PY, 21).

A critical purpose of a product warning is to ensure the operator is aware of important safety information at the time and location it is needed (1-6,12). However, the BMW Rider's Manual has the disadvantage of typically not being available or used during subsequent or later uses of the motorcycle. A consequence of this expected nonuse of the Rider's Manual is that the warnings previously read in the manual are of no use to the rider if they are not thinking about it at the time the safety information is needed because they are focused on something else or simply forgot (2,3,12). For example, Parvez testified that he read the manual he was given with the motorcycle when he purchased it (PY, 22-24). However, Parvez also testified that when he was starting the motorcycle on the day of the fire he was not thinking about the warnings in the manual, he did not remember any warnings he may have read in the manual, and was not aware of the risk of letting the motorcycle run at a standstill (PY, 14,20,21).

Effective warnings not only inform people of information they were not previously aware of but also remind users of critical safety information that they may have previously learned or encountered at the time and location the information is needed (2,12). The use of product warnings as a cue or reminder at the time and location the information is needed is related to the distinction between knowledge versus awareness (12). For example, Laughery and Hammond provided the following discussion on the importance of knowledge versus awareness in the design and use of product warnings in their introductory chapter to the textbook *Warnings and Risk Communication* (12):

The distinction between knowledge and awareness is important in understanding issues of risk perception and how they map on to the design and effectiveness of warnings. The difference is analogous to a distinction made in cognitive psychology between short term memory (this may be thought of as what is in consciousness) and long term memory (one's more permanent knowledge of the world). The point is simply that people may have information or experiences in their overall knowledge base that at any given point in time is not what they are thinking about (i.e., they are not aware of or conscious of that information). In the context of dealing with hazards, it is not enough to say that people know something. Rather it is critical that people be aware of (thinking about) the relevant information at the right time. This distinction has significant implications for one of the important functions of warnings: they serve as reminders or cues which help access that information stored in memory.

There are multiple reasons why a product user may not remember a critical warning that they may have read or encountered in the past including distraction, inattention, interference, hurrying, stress, forgetting, etc. (2,3,12). Fundamental safety considerations to overcome these basic human factors is to eliminate the hazard through design, minimize the hazardous consequences of the user's actions, provide necessary safe guards, and/or provide salient cues where and when needed to draw the user's attention to the potential hazard and the actions necessary to avoid the hazard (2,3,12).

On-product warnings are typically relied upon to overcome the shortcomings of warnings presented in product manuals (1-6,12). For example, on-product warnings are typically presented where and when the information is needed, are designed and formatted to draw attention and stand out from clutter and other information, and are used as a cue to remind users of information they may have learned before but were not currently thinking about (1-6,12). On-product warnings are also a reliable way of ensuring critical safety related information is available to secondary owners/users compared to "hoping" that they are given a manual when purchasing the motorcycle second hand.

Consistent with the benefits of on-product warnings, standards and guidelines for the design of effective warning systems recommend that critical warning information be presented on the product to ensure the information is seen, read, and heeded at the time and location it is needed. For example, ANSI Z535.4, *Product Safety Signs and Labels*, provides the following recommendation for the placement of product warnings (4):

Product safety signs and labels shall be placed such that they will: (1) be readily visible to the intended viewer and (2) alert the viewer to the potential hazard in time to take appropriate action.

In their chapter on attention switch and maintenance of warnings, published in the textbook *Handbook of Warnings*, Wogalter and Vigilante note (3):

In general, a warning's attention getting power will be facilitated by placing it close (or proximate) in time and space to the hazard. Thus, in most cases warning noticeability will be benefitted by its attachment directly to the product (or its container) as opposed to a more distant placement such as in a separate instruction manual.

And

However, the warning should not be too distantly placed from a hazard as it might be forgotten in the intermediate time. For example, a verbal warning given to a farm worker who a week later starts using a hazardous pesticide is less likely to be remembered, and therefore, less effective than one given immediately prior to using the product.

With respect to design and placement of critical safety warnings, Woodson et al. note in their textbook *Human Factors Design Handbook* (2):

Make critical signs and signals conspicuous, legible, visible, and understandable and place them where the user is expected to be looking.

In a paper published in the journal *Occupational Health and Safety*, Peters provides the following guideline for the placement of product warnings (5):

The warning should be placed where needed and when needed. A warning buried in an operator's manual may be of little help to a typical machine operator.

The FMC Corporation is one of the world's foremost diversified chemical companies in the world and a leader in the agricultural, industrial, and consumer markets. In their 1990 edition of their *Product Safety Signs and Label System* manual, FMC notes (6)

When such safety signs and labels are placed on products in appropriate locations, they can help to reduce the occurrence of accidents through more effective communication.

Contrary to contemporary industry standards and guidelines for the design of effective warning systems, BMW NA failed to provide any warning on Yazdani's R1150 R motorcycle regarding the risk of fire if the motorcycle engine is warmed up at a standstill (MY, 157).

It was not reasonable for BMW NA to rely solely upon the use of the Rider's Manual to warn subsequent BMW R1150 R motorcycle owners and riders of the fire hazard associated with warming up the engine with the motorcycle at a standstill. BMW NA should have conspicuously and permanently placed a warning directly on the motorcycle and the motorcycle was defective and unreasonably dangerous without the warning.

BMW NA failed to provide an adequate warning system, which included a conspicuous on-product warning, which met contemporary industry standards, guidelines, and practices regarding the fire hazard associated with warming up the motorcycle engine at a standstill.

BMW NA's failure to provide an adequate warning system regarding the fire hazard associated with warming up the engine at a standstill, which included the use of a conspicuous on-product warning, was unreasonably dangerous, rendered the BMW R1150 R motorcycle defective and unreasonably dangerous, needlessly placed consumers and product users in danger, and caused the fire.

BMW NA's failure to provide an adequate warning system regarding the fire hazard associated with warming up the motorcycle engine at a standstill deprived Parvez Yazdani of critical safety information he needed to safely use the motorcycle. For example, Parvez Yazdani testified that prior to the fire:

- He did not understand the risk of overheating the engine by letting the motorcycle engine run at a standstill (PY, 20);
- He never thought that warming up a motorcycle would result in it catching fire (PY, 20).

- He was not aware that he was doing anything unsafe and he thought it was safe to let the motorcycle engine idle (PY, 27).

BMW NA's failure to comply with long known applicable guidelines, practices, and the American National Standard Z535.4 deprived Parvez Yazdani of the protection afforded to the public by those guidelines and standards.

BMW NA's failure to provide an adequate warning system is evident in Mark Yeldham's investigation of 6 to 12 motorcycle fires caused by the failure of the oil sight glass cover due to excessive engine oil temperatures (MY, 121).

E.2. BMW NA was aware of the need to provide adequate warning including an on-product warning.

BMW NA was aware of the need to provide a warning label directly on their motorcycles to alert, inform, and remind riders of the potential fire hazard associated with allowing a BMW motorcycle with an air-cooled engine to warm up at a standstill (MY, 156).

In 1997, BMW NA implemented a recall campaign related to the 1994 to 1997 model year BMW R1100RSL motorcycles. The recall involved BMW NA sending out and adding warnings labels to the steering head/upper fork bridge of R1100RSL motorcycles (MY, 170,171). The recall warning label stated:

Avoid increased idle speed
at a standstill with choke in use.
Risk of overheating and fire.

The recall campaign also included an insert that was added to the Rider's Manual for the BMW R1100RSL. The insert includes the following a warning:

Warning

Do not keep the engine running while the motorcycle is at a standstill – risk of overheating and fire.

Ride away immediately after starting the engine.

A similar warning appears in the Rider's Manual of the BMW R1150 R motorcycle as noted in the previous section of this report.

The BMW R1100RSL motorcycle possesses an air-cooled engine similar to the BMW R1150 R motorcycle. Unlike the BMW R1150 R, the BMW R1100RSL possesses a full front fairing. Both the BMW R1100RSL and the R1150 R possess manual chokes controlled by the rider. The choke increases the engine idle speed (i.e., RPM) to help the engine warm up faster (MY, 72,73,137). However, as the engine temperature increases, the engine idle speed will increase when the

choke is in the full or detent position (MY, 137,138). As the engine speed increases so does the temperature of the engine and engine oil (MY, 134-136).

Similar to the BMW R1100RSL, there is a fire hazard associated with the BMW R1150 R motorcycle if the engine is allowed to run when the bike is stationary (MY, 177). Mark Yeldham, BMW NA corporate designee, testified that BMW NA is aware of only two modes for the BMW R1150 R motorcycle to catch fire when it is left idling at a standstill: (1) the oil sight glass fails allowing extremely hot oil to escape the engine, and (2) body work (e.g., front fairing) or wiring harness near the exhaust header is heated (MY, 130). The latter is the same failure mode prompting the recall campaign that BMW NA initiated in 1997.

Although the BMW R1150 R motorcycles possess a fire hazard potential similar to the R1100RSL, BMW NA failed to provide any warning label directly on the BMW R1150R motorcycle to alert, inform, and/or remind riders of the potential fire hazard associated with warming up the engine at a standstill.

Mark Yeldham testified that they added the recall label to their BMW R1100RSL motorcycles because there was a risk of fire if the bike was left running while stationary (MY, 175-177). Mark Yeldham also testified that the label was added to make the end user aware that there was a risk of fire (MY, 175). Yeldham's testimony is consistent with BMW NA's admission that "..., because the product is too complex and the average or ordinary consumer would not be capable of forming an expectation about the product.¹"

It is the complexity of the fire hazard scenario and the improbability that the rider will expect a fire to occur by simply allowing the motorcycle to idle in a stationary position that made it critical for BMW NA to ensure that adequate warning was provided with their BMW R1150 R motorcycles. To foresee the potential fire hazard associated with warming up the engine with the motorcycle at a standstill without adequate warning, the rider would have to know that:

1. The motorcycle possesses an air-cooled engine;
2. Engine heat is dissipated by moving air across the engine's cooling fins and if the bike is not moving the air flow will not be adequate to dissipate the heat;
3. As the engine temperature rises, its speed will increase, which further increases the temperature of the engine;
4. As the engine temperature increases, the oil temperature increases as well;
5. The R1150 R engine possess an oil sight glass;
6. The oil sight glass possess a plastic cover that fails at 329°F and a seal that can also fail at elevated temperatures;
7. Engine oil can reach 329°F if the engine is allowed to warmup in a stationary position;
8. The elevated engine temperature can cause the oil sight glass to fail;
9. If the oil sight glass fails, extremely hot oil liquid and vapors will be released from the engine;

¹ BMW NA's Answer with Affirmative Defenses: Fourteenth Affirmative Defense.

10. The oil vapors can ignite upon contacting the exhaust header causing a fire.

Unfortunately, most people lack awareness of, experience with, and/or knowledge of the technology features of many products, including mechanical relationships, thermal characteristics, gaseous and combustible materials, and conditions that cause fires (2,12). Because people generally do not know what causes products to ignite or explode they are not prepared to identify or deal with the potential hazard without adequate warning (2). Most people would not be expected to appreciate or anticipate the chain events and characteristics of the BMW R1150 R motorcycle that creates the fire potential without adequate warning (2,12-14).

The prohibition against letting the motorcycle engine warmup while stationary is also inconsistent with common experience and practice. For example, it is common for people to allow motor vehicles to warm up after starting before driving away or to let a vehicle idle for an extended period of time. Consistent with these common experiences, Mark Yeldham testified that:

- He has started his car on a cold day and let the engine warm up before he got it in and drove away (MY, 81,82).
- People generally know that starting up a cold engine on a winter's day and then flying down the street at high speed is not a good idea (MY, 81).
- Everyone knows that when you start an engine on a very cold day it does not start up so readily and it is not smooth right away (MY, 80).
- When it is really cold outside, you have to hold the choke open longer until the engine warms up and smooths out and that if you close the choke too soon the engine can stall (MY, 88).
- It is foreseeable that riders will get stuck in traffic which can result in the engine running while the motorcycle is stationary for an extended period of time (MY, 146,147).

Other motorcycle manufacturers do not prohibit riders from warming up their engine while the motorcycle is at a standstill. On the contrary, competitor motorcycle manuals explicitly state that the engine should be warmed up before riding off. For example, 2002 Yamaha motorcycle manuals state:

CAUTION: For maximum engine life, always warm the engine up before starting off.²

Harley Davidson also notes under the "Starting the Engine" section of their 2007 Softtail motorcycle manual:

² Owner's Manuals for 2002 models XVS1100AWR and XVS1100ATR (LIT-11626-16-46. Pg. 5-3) and RoadStar XV16A/AT (Pg. 5-2).

CAUTION:

The engine should be allowed to run slowly for 15-30 seconds. This will allow the engine to warm up and let oil reach all surfaces needing lubrication. Failure to comply can result in engine damage.

The 2002 Yamaha motorcycles cited have a manual choke. The 2007 Softtails are fuel injected without a manual choke. Both the Yamaha and Harley Davidson motorcycles cited feature air-cooled engines.

BMW NA implemented the recall campaign after receiving notice of eleven incidents related to the fire hazard associated with the design and operation of the R1100RSL motorcycle. Predictably BMW NA learned during their investigation of the incidents that many owners reported that the motorcycle had been left unattended at engine speeds above idle causing the engine to overheat. Similar to the scenario that BMW NA's recall campaign was intended to address, the current fire occurred when Yazdani left the motorcycle unattended while warming up the engine to keep everything running during the colder months (PY, 14-16,64).

BMW NA knew or should have known that a warning label was needed on the BMW R1150 R motorcycle to alert, inform, and/or remind riders of the potential fire hazard associated with letting the engine warm up at a standstill.

E.3. BMW NA should have provided an adequate warning system.

If they chose not to eliminate or guard against the fire hazard associated with warming up the engine at a standstill, BMW NA should have ensured that a conspicuous on-product warning was provided on the BMW R1150 R motorcycles. The warning should have been placed on cockpit (e.g., above the ignition switch and below the ABS warning light) or the upper fork bridge/steering head of the BMW R1150 R motorcycle (MY, 170). The warning should have alerted riders to the fire hazard associated with allowing the motorcycle engine to warm up at a standstill.

Illustration 1 presents an example of an on-product warning meeting the ANSI Z535.4-2002 criteria for on-product safety warnings that BMW NA should have permanently presented on the BMW R1150 R motorcycle (4).



Illustration 1. Fire hazard warning.

The warning depicted in Illustration 1 should have been repeated in the motorcycle's Rider's Manuals with an explanation of how the fire occurs (e.g., oil temperature increases to an elevated level causing the oil sight glass to fail and allow hot oil to escape the engine or heat from the exhaust headers can ignite the body work or wiring harness).

It would have been reasonable for BMW NA to provide an adequate warning system, including a conspicuous on-product warning, with the BMW R1150 R motorcycle. The cost in terms of money, effort, and time to do so would have been minimal and insignificant. For example, BMW NA added a warning label to the upper fork bridge/steering head of the BMW R1100RSL motorcycles they recalled to make riders aware of the potential fire hazard associated with letting the engine warm up at a standstill (MY, 170,175).

Had an adequate warning system, including a conspicuous on-product warning, been provided, BMW NA would have ensured that the Parvez Yazdani was provided with the information he needed to make an informed decision as to his operation of the incident BMW R1150 R motorcycle and avoided the fire.

F. FINDINGS

Within the bounds of reasonable scientific certainty, and subject to change if additional information becomes available, it is my professional opinion that:

1. BMW could not reasonably rely on dealer provided training to alert, inform, and remind all potential users of the motorcycle of the fire hazard created by attempting to warm up the engine with the motorcycle at a standstill.
2. It was not reasonable for BMW NA to rely solely upon the use of the Rider's Manual to warn subsequent BMW R1150 R motorcycle owners and riders of the fire hazard associated with warming up the engine with the motorcycle at a standstill.
3. BMW NA should have conspicuously and permanently placed a warning directly on the motorcycle and the motorcycle was defective and unreasonably dangerous without the warning.
4. BMW NA failed to provide an adequate warning system, which included a conspicuous on-product warning, which met contemporary industry standards, guidelines, and practices regarding the fire hazard associated with warming up the motorcycle engine at a standstill.
5. BMW NA's failure to provide an adequate warning system regarding the fire hazard associated with warming up the engine at a standstill, which included the use of a conspicuous on-product warning, was unreasonably dangerous, rendered the BMW R1150 R motorcycle defective and unreasonably dangerous, needlessly placed consumers and product users in danger, and caused the fire.
6. BMW NA's failure to provide an adequate warning system regarding the fire hazard associated with warming up the motorcycle engine at a standstill deprived Parvez Yazdani of critical safety information he needed to safely use the motorcycle.

7. BMW NA's failure to comply with long known applicable guidelines, practices, and the American National Standard Z535.4 deprived Parvez Yazdani of the protection afforded to the public by those guidelines and standards.
8. BMW NA's failure to provide an adequate warning system is evident in Mark Yeldham's investigation of six to 12 motorcycle fires caused by the failure of the oil sight glass cover due to excessive engine oil temperatures (MY, 121).
9. It is the complexity of the fire hazard scenario and the improbably that the rider will expect a fire to occur by simply allowing the motorcycle to idle in a stationary position that made it critical for BMW NA to ensure that adequate warning was provided with the BMW R1150 R motorcycles.
10. BMW NA knew or should have known that a warning label was needed on the BMW R1150 R motorcycle to alert, inform, and/or remind riders of the potential fire hazard associated with letting the engine warm up at a standstill.
11. BMW NA should have ensured that a conspicuous on-product warning was provided on the BMW R1150 R motorcycles they distributed in the United States.
12. It would have been reasonable for BMW NA to provide an adequate warning system, including a conspicuous on-product warning, with the BMW R1150 R motorcycle. The cost in terms of money, effort, and time to do so would have been minimal and insignificant.
13. Had an adequate warning system, including a conspicuous on-product warning, been provided, BMW NA would have ensured that the Parvez Yazdani was provided with the information he needed to make an informed decision as to his operation of the incident BMW R1150 R motorcycle and avoided the fire.



William J. Vigilante Jr., Ph.D.

G. REFERENCES

1. NSC (2001). Accident Prevention Manual for Business & Industry: Administration & Programs (12th Edition). Pgs. 110-117, 491-507.
2. Woodson, Tillman, & Tillman (1992). Human Factors Design Handbook. Pgs. 363,714-718, 789.
3. Wogalter & Vigilante (1999). Chapter 18: Attention Switch and Maintenance. In Handbook of Warnings. Pgs. 245-265.
4. ANSI Z535.4 (2002). Product Safety Signs and Labels.
5. Peters (1984). 15 cardinal principles to ensure effectiveness of warning systems. Occupational Health and Safety. May, 76-79.
6. FMC (1990). Product Safety Sign and Label System.
7. Wright, Creighton, & Threlfall (1982). Some factors determining when instructions will be read. Ergonomics, 25. Pgs. 225 – 237.
8. Celuch, Lust, & Showers (1992). Product owner manuals: an exploratory study of nonreaders versus readers. Journal of Applied Social Psychology, 22(6), 492-507.
9. Wogalter, Vigilante, & Baneth (1998). Availability of operator manuals for used consumer products. Applied Ergonomics, 29(3). Pgs. 193-200.
10. Wogalter, Brelsford, Desaulniers, & Laughery (1991). Consumer product warnings: the role of hazard perception. Journal of Safety Research, 22, Pgs. 71-82.
11. Wogalter, Barlow, & Murphy (1995). Compliance to owner's manual warnings: influence of familiarity and the placement of a supplemental directive. Ergonomics, 38(6), 1081-1091.
12. Laughery and Hammond (1999). Chapter 1: Overview. Warnings and Risk Communication. Pgs. 3-9.
13. Weegles & Kanis (2000). Risk perception in consumer product use. Accident Analysis and Prevention, 32. Pgs. 365 – 370.
14. Wagenaar (1992). Risk taking and accident causation. In Risk-Taking Behavior (Ed. Yates). Pgs. 257-280.

15-003: Yazdani fire

Page 18 of 18

H. APPENDIX